REMARKS

Claims 13-16 are active in the application. Claims 1-12 have been canceled without prejudice or disclaimer as being directed to a non-elected invention.

The specification has been amended to correct spelling and grammatical errors. No new matter has been added.

Claim 16 has been amended to correct an antecedent basis error relating to the phrase "reach through collector". Also, claim 16 has been amended to correct a typographical error.

Claim 13 has been amended to address matters raised in the office action. Specifically, claim 13 has been amended to specify that the emitter stack includes a cap layer that provides implant masking. This added feature is supported by the specification at page 14, lines 8-11 and lines 18-19, which describe the nitride cap layer 64 as functioning as a mask during ion implantation. Also, claim 13 has been amended to require that the emitter stack does not have spacers. This is supported by Figs. 2E-2I, which illustrate that spacers are not used in the present invention, and is supported by the specification at page 17, lines 15-16, which teach that spacers are not used in the present invention.

Claims 13, 14, and 16 were rejected under 35 USC 103(a) as being unpatentable over US patent 6,177,717 to Chantre et al. in view of US patent 6,410,975 to Racanelli. These rejections are traversed on the grounds that neither Chantre et al. nor Racanelli teach a directly aligned extrinsic base region in combination with an implant-mask cap on the emitter stack, and absence of spacers. Furthermore, no combination of Chantre et al. and Racanelli would produce or make obvious a device with all of the features set forth in the claims.

The present invention provides an improved bipolar transistor having extrinsic base regions that are directly aligned with an emitter stack. The direct alignment arises because the emitter stack is used as a mask for ion implantation of the extrinsic base regions. Since spacers are not used in the present invention, the edge of the emitter stack defines the edge of the extrinsic base region. This provides direct alignment between the extrinsic base region and the emitter stack. Fabricating a bipolar transistor according to

the teachings of the present invention provides increased efficiency and reduced cost. Specifically, high-pressure oxidation steps and spacer fabrication steps are eliminated, and less high-temperature processing is required. Additionally, the direct alignment between the extrinsic base and emitter stack provides an accurate and small distance between the base and emitter regions.

The Office Action correctly notes that Chantre et al. do not teach an extrinsic base region *directly aligned* with an emitter stack. However, Chantre et al. cannot be modified to have directly aligned extrinsic base regions, as suggested in the Office Action. This is because direct alignment of the extrinsic base regions according to the present invention requires ion implantation *without spacers*. That is, direct alignment requires that the emitter stack function as an ion implantation mask so that the edge of the emitter stack defines the edge of the implanted extrinsic base regions. Chantre et al. does not and cannot meet these requirements because Chantre et al. require the use of spacers 120 during ion implantation of the extrinsic base regions (see col. 7, lines 1-4 and 10-12). Chantre et al. provide no teaching or suggestion that the spacers 120 are optional, and furthermore, careful reading of Chantre shows that use of the spacers 120 are required. Hence, Chantre et al. cannot reasonably be modified as suggested in the Office Action, and the rejections of claims 13, 14 and 16 based on this modification must be withdrawn.

The Examiner has erroneously argued that Racanelli teach a bipolar transistor with extrinsic base regions directly aligned with the emitter stack. Racanelli is concerned with reducing base resistance by incorporating a 'dopant spike' under a dielectric segment 140 440.

Racanelli is mostly silent with regards to fabrication techniques (see col. 8, lines 42-57), and does not teach or suggest direct alignment between the extrinsic base regions and the emitter. Racanelli simply does not meet the direct alignment limitation of claim 13. Accordingly, the rejection of claim 13 based on the combination of Chantre et al. and Racanelli must be withdrawn.

Furthermore, Racanelli is lacking a feature essential for providing direct alignment according to the present invention: an implant-masking cap layer on top of the emitter. Without an implant-masking cap layer on the emitter, the emitter will be implanted with the same ions as the extrinsic base regions. This will render the emitter

unusable in the transistor. Hence, 'direct alignment' as practiced in the present invention requires an implant-masking layer over the emitter (cap layer indicated at 64 in Fig. 2E), and this cap layer is not taught, shown, or suggested by Racanelli. Hence, Racanelli cannot be modified to meet the 'direct alignment' limitation of claim 13, and the rejections based on Racanelli must be withdrawn for this additional reason..

In order to emphasize this difference between the present invention and Racanelli, claim 13 has been amended to include the limitation: "said emitter stack including an implant-masking cap layer on top of said T-shaped polysilicon". Chantre et al. also does not show an implant masking layer. Chantre et al. only shows a silicide contact pad S, which is applied after implantation (see col. 7, lines 9-22). As noted above, Chantre et al. employ spacers for defining the edges of the extrinsic base regions, and therefore the extrinsic base regions of Chantre et al are not directly aligned with the emitter.

Accordingly, the rejections of claim 13 must be withdrawn for several reasons: 1) Chantre et al. includes spacers and so cannot be modified to have directly aligned extrinsic base regions, and 2) Racanelli does not teach direct alignment between the extrinsic base and the emitter stack, and 3) Racanelli lacks a cap layer, essential for providing direct alignment according to the present invention, and now added to claim 13 by amendment. Chantre et al. also lack a cap layer.

Regarding claim 16, it is argued that neither Chantre et al., Racanelli or the admitted prior art teach or suggest mid-end-of-line contacts.

In view of the foregoing, it is respectfully requested that the application be reconsidered, that claims 13-16 be allowed, and that the application be passed to issue.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

A provisional petition is hereby made for any extension of time necessary for the continued pendency during the life of this application. Please charge any fees for such provisional petition and any deficiencies in fees and credit any overpayment of fees for the petition or for entry of this amendment to Attorney's Deposit Account No. 50-2041 (Whitham, Curtis & Christofferson P.C.).

Respectfully submitted,

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